New students, new learning, new environments in higher education: Literacies in the digital age

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Information literacy is developing new meanings and importance in the online age of teaching and learning in higher education. Information literacy, as a highly prized graduate attribute, is related to the development of lifelong learning capacities. Its strong re-emergence in the form of digital literacy in the context of major online developments at Deakin University is considered through four cases. In each case the reader is asked to consider how the teaching staff members have conceived critical discipline-based information and digital literacies, how these conceptions are related to desired learning outcomes, the types of digital and online environments designed to support the development of these literacies, and how each one contributes to the development of lifelong learning capacities. Information and digital literacy is enlivened through being situated in broader understandings of new generations of learners, new forms of learning and new e-supported learning environments. Educational design, evaluation, research and technology implications of these new types of digital and online-based teaching and learning environments are finally examined.

Keywords: information literacy, digital literacy, teaching and learning environments, wholly online units, education design

Introduction

Universities continue to invest large sums of money in corporate technology networks, systems and applications to help enhance the quality, efficiency, accessibility and satisfaction of teaching and learning in higher education. This appears to be a worldwide phenomenon with, for example, most universities in Australia having adopted a commercial learning management system. Increasingly though, such technology investment and the types of e-learning developed, are coming under critical scrutiny. Is money expended on technology making a significant difference to teachers and learners? Are new forms of enduring teaching and learning value likely to be created, as Holt and Segrave (2003), posed? Often, academic teaching staff are brought reluctantly to use technology; at best unsure of the benefits, and with a strong sense of responding to the policy dictates of their University leadership. At worst, perceptions of compliance can lead to either outright rejection or passive resistance to the constructive use of online teaching and learning systems. These responses to attempted change management relating to implementing e-learning need recognition and thoughtful response.

Here we present a useful perspective on designing and teaching with the new digital media and online systems which might help teaching staff in exploring discipline-specific meanings of information and digital literacy for lifelong learning. In doing this, we foreground what is generally agreed to be a well theoretically grounded view of the meaning of quality learning in higher education and its implications for quality teaching. With this as the starting point, we move on to open up the various possible dimensions of new forms of information and digital literacies by examining six significant unit developments in our institution organised into four major cases. These cases are used as points of reflection for questions relating to meanings ascribed to particular curriculum developments, some of which are themselves focussed on the new technologies as key areas of study, educational strategies supportive of the development of contextually-based information and digital literacies, types of technology systems required to enable the development of these literacies, and the relationships of such literacies with the development of lifelong learning capacities.

Implications are drawn on several fronts: for educational design of new forms of teaching/learning environments in higher education and as related to new generations of learners; for new evaluation and research agendas; and for new technological environments supportive of quality learning outcomes. We

see information and digital literacy (as key capacity for lifelong learning) as a constructive means of revitalising curriculum development in the context of e-learning possibilities.

Background

We reflect on key issues relating to discipline-specific understandings and practices of information and digital literacy drawing on two areas of research and development work undertaken at Deakin University. The first relates to a strategic teaching and learning grant scheme project completed in 2005 which compiled a suite of cases of contemporary online teaching practice, and reported by Holt, Borland, Farmer, Rice and Mulready (2005). Certain cases covered are grounded in these contemporary developments and are acknowledged as such. The second relates to a research project undertaken by Holt and Challis (2006) on teaching and learning experiences related to a select number of undergraduate units taught wholly online at the University. This research has encompassed in-depth interviews with teachers of the wholly online units and a survey undertaken of the online learning experiences of students in these units. Excerpts of the in-depth interviews have been included to explain the purposes of certain of the units presented. Both initiatives have informed the overall basis of this exploration into varied meanings of developing information and digital literacies in a range of disciplines and as related to a range educational concerns.

Contemporary teaching and learning environments in higher education

> The story seems to be the same around the world. This university-based process of diffusion is significant because it has the highest potential for spreading both the knowledge and the habits of CMC [Computer-Mediated Communication]. …As CMC becomes more pervasive in the university system on an international scale, the graduates that will take over companies and institutions in the early twenty-first century will bring with them the message of the new medium into the mainstream of society (Castells, 2000, p.384).

While Holt and Thompson (1995) identified a staff-perceived imperative in developing and using education technologies as part of the University's strategic move to flexible learning, Castells (2000) reminds us that beyond a sense of compunction still often experienced by many teaching staff required to comply with certain levels of technology usage**,** universities have played a more proactive and creative role in diffusing new technologically-supported social innovations through successive generations of students who in turn carry these capacities into their future employment and citizenship role. The overall environment within which moves to technologically-enhanced teaching and learning has arisen has been characterised by both what seem to be key common strategic priorities relating to teaching, learning and the curriculum, and the major adoption of corporate technologies in support of these priorities across the higher education sector. The strategic teaching and learning priorities cover graduate attributes, internationalisation, experiential learning, and student-centred learning, attributes of excellent teaching and online teaching and leaning. Corporate technologies include learning management systems, digital object management systems, and synchronous communication systems, streaming technologies, gateways, portals and email. Additionally, technologies continue to emerge of potential significance to enhancing e-learning environments like weblogs, wikis and podcasting. In regard to teaching and learning priorities, we believe these are not necessarily straightforward in meaning or practice. Commitments to, for example, student-centred learning are varied in nature and often contested in concept and practice, an observation which is revealed through the cases presented.

Holt and Segrave (2003), in engaging with the challenge of creating and sustaining enduring teaching and learning value through the major investments that have been made in corporate technology infrastructure, systems and applications in recent years, identified six area of great potential. With these potential areas lies the possibility of e-learning to support the development of information literacy in the service of lifelong learning. In fact, it can be argued that e-learning requires new forms of information literacy along with the new forms of curriculum which may make new technologies a key focus of study of and in itself. These matters have become germane in Deakin University's move to extended and wholly online forms of teaching and learning. These new types of teaching/learning environments foreground the nature and importance of information literacy, as underpinning lifelong learning, in the context of curriculum innovation and new digitally and online-centred environments.

Defining information and digital literacy for lifelong learning

On Deakin University's Library website, the definition and skills associated with information literacy are outlined:

> **What is information literacy?**
> The American Library Association defines information literacy as 'an understanding and set of abilities enabling individuals to recognise when information is needed and have the capacity to locate, evaluate, and use effectively the needed information' (CAUL, 2001). Although definitions may vary in detail, there is a common acceptance that information literacy focuses upon developing skills and knowledge in relation to finding, evaluating and working effectively with information.

To be information literate is seen to be an important graduate attribute, related to the need to be information technology literate, and a key capacity related to lifelong learning. Such a well recognised definition, pitched at a general level, can clearly be seen to be applicable to all disciplines and fields of study. It underpins many generic information literacy training initiatives. Deakin University has further elaborated what it has termed 'exemplary characteristics' of each of its identified graduate attributes. For information literacy, it identifies the following characteristics, in addition to those elements of the definition given above: *interpret and solve problems* appropriate for a *beginning professional within the discipline*; *demonstrate knowledge* of typical problems met at *initial levels of practice; read, interpret, synthesise, evaluate* and communicate using the vocabularies, modes, genres, symbols and terms used *within the field of study; use current technologies* appropriate to *entry level work in the field* (Deakin University, 2002, p.6).

Candy, Crebert and O'Leary (1994, p.43) reinforces the importance of information literacy being seen as embedded with disciplinary concerns by highlighting the ability to identify major resources and frame researchable questions in at least one field as part of their definition. Candy et al. (1994) again argue for the centrality of information literacy in the context of developing lifelong learning capacities. In a latter work focussing on the digital revolution and self directed learning, Candy (2004) extends the argument into the realm of digital literacy encompassing or blending technical competence (ICT literacy), information gathering, evaluation and problem solving (information literacy) and the networked, socially constructed knowledge creation and sharing of the net. Candy's work on the nature and importance of digital literacy to contemporary forms of adult learning is matched in *enGauge 21st Century Skills: Literacy in the Digital Age* (2003), an investigation directed, inter alia, at the explication and development of digital-age literacy (and most relevant within this category visual and information literacy) amongst children and adolescents in the schooling system as one of the keys to new age learning.

The views of both resonate with those of Gilster (1997, p.31 & p.33) on digital literacy: 'So literacy in the digital age – digital literacy – is partly about awareness of other people and our expanded ability to contact them to discuss issues and get help. …Developing the habit of critical thinking and using network tools to reinforce it is the most significant of the network's core competencies'. What these views suggest, we believe, is that achieving digital literacy involves moving from a conception of information residing in discrete stable forms of analog media (predominately words and numbers) processed and used individually, to a richer conception of information reverberating through forms of multiple media (increasingly audio-visual), having digitally merged, and become available for continual recycling through collaborative recreations as 'resources in use'. Along with information and technology literacy, Deakin highlights confidence in one's professional development and ability to explore the field, the taking of personal responsibility for one's learning, the capacity to seek out and exploit new learning opportunities, and self-awareness of one's learning approach and style, as all being exemplary characteristics of a *capacity for lifelong learning and an appreciation of its necessity* (Deakin Advantage Guidelines for developing the attributes of a Deakin graduate 2002, p.12).

What comes out of such reviews of information and digital literacy and lifelong learning is the need to examine such desired graduate attributes in the context of specific disciplines and fields of study. Attribute meanings are understood and enacted in contexts. What information and digital literacy means,

and how they are enacted and enhanced in the online age, becomes the double-edged challenge. It is one we examine in four cases further in this paper.

Major questions relating to digital literacy development for e-learning

Our starting point is Ramsden's (2003) view of quality learning in higher education and its implications for conceiving quality teaching:

> …learning in educational institutions should be about changing the ways in which learners understand, or experience, or conceptualise the world around them. The 'world around them' includes the concepts and methods that are characteristic of the field of learning in which they are studying. …The aim of teaching is simple: it is to make student learning possible. Teaching always involves attempts to alter students' understanding, so they begin to conceptualise phenomena and ideas in the way scientists, mathematicians, historians, physicians or other experts conceptualise them – in the way, that is to say, that we as academics want them to understand them (pp. 6-7).

'The ways we want them to understand them' is the nub of being literate in the disciplinary sense and captures the thrust of its developing meanings in this paper as disciplines and professional fields shape and become increasingly shaped by new digital and online technologies. The digital and online worlds of teaching and learning create new forms of communicative competence beyond traditional styles of verbal and written communication competence. New styles of communicative competence on the Internet, and its particular domains of activity, are emerging (Crystal, 2001). New forms of visual, auditory, technological, cultural and numerical literacies can be seen, all of which need to be considered within different disciplines and their ways of knowing and knowledge construction. The answers to old questions relating to information acquisition and evaluation in traditional media become more problematic when dealing with data, information and knowledge construction on the Web, or as some might say the 'World Wild Web' given its ever changing nature, complexity and size. Judging the veracity of information and the trustworthiness of knowledge claims on the Net becomes more challenging and adds a new dimension to being information and digitally literate in the online age.

Discipline-specific information and digital literacy in extended and wholly online units at Deakin University

The four cases represent six major unit developments at Deakin University which highlight different facets of developing critical subject embedded forms of information and digital literacy. Each case will briefly outline the relevant unit purposes and information literacy challenges. All of the units examined represent major new curriculum and online developments at the University. Four of the six units mentioned are wholly online developments (see Armatas, Holt & Rice, 2004, for Deakin's definition of wholly online units and further case of teaching wholly online in *Research Methodology in Psychology*). For each, the reader should consider the following questions based on understandings around developing information and digital literacies for quality life-long learning: How are each of the units defining and positioning information and digital literacy as a curriculum challenge?; How are notions of information and digital literacy being related to desired student learning (as in seeing things from new perspectives)? What particular teaching, assessment and media/technology strategies could be used in developing such literacies?; What major technology systems might be required to support the units' learning experiences?; How do the various units contribute to the development of life-long learning capacities? Educational design, evaluation, research and technology implications will be drawn from these cases in the final section of the paper.

Case 1: Developing information literacy in first year in the biological sciences, and health and behavioural sciences

Health Information and Data, offered in first year in semesters 1 and 2, is one of four foundation units which must be taken by all students enrolled in courses offered by the Faculty of Health, Medicine, Nursing and Behavioural Sciences at Deakin (see Story (2005) for further case information). *Science Skills in Context*, offered in semester 1, year 1, is a unit which must be undertaken by all students enrolled

in any one of six courses in biological sciences in Deakin's Faculty of Science and Technology (i.e. biology, biomedical sciences, biological and chemical sciences, biotechnology, forensic science and wine science). Both units are being offered wholly online and are seen as key building block subjects for students commencing studies in the health and physical sciences. *Health and Information and Data* is taken by around 1200 students, while *Science Skills in Context* is taken by about 190 students, per semester, respectively. Both attempt to ground forms of information literacy in the context of understanding scientific methods of enquiry, and, with both offered wholly online, there is the added focus of developing forms of digital literacy relevant to dealing with scientific data and information.

Health Information and Data is aimed at developing students' understanding of different ways that health research is conducted and how research results are presented, skills in searching for and retrieving health information and data from online sources, capacities to evaluate critically health research and popular health claims, knowledge of the principles of evidence-based practice when evaluating health research, knowledge of and interpretive skills in basic quantitative analyses in health research, and skills in reading, interpreting and critically reflecting on peer-reviewed health research articles. As the Unit Team Chair commented in relation to the rationale for information literacy being developed by students in this type of wholly online unit subject area: '…the unit covered issues to do with health information and data it seemed, in terms of matching up the modality and the content, it was an obvious marriage that could work to encourage students into this online space with a pretty good rationale that they're going to be using this space in their professional lives down the track. And so it was not an artificial task to make them go online to look up information and interpret that because that's how they do it in the future. Now, they seem to have swallowed that rationale fairly well.'

Closely mirroring such capacities, *Science Skills in Context* aims to provide students with a working knowledge of information systems and their applications to the biological and chemical sciences, understanding of scientific method and experimental design, prerequisite numeric skills for advanced study in the biological and chemical sciences, and skills in how to interpret, critically evaluate, summarize and reference scientific information and data. *Science Skills in Context* has benefited from the preceding development and teaching of *Health Information and Data*. The Unit Team Chair explains the reason why the unit is offered wholly online:

> The transition from secondary to tertiary study requires you to develop a capacity for self-learning. As more information becomes exclusively available in electronic format (e.g. Government reports / Medical Journals / contents of web pages) the ability to learn online in a comprehensive and efficient manner is very important to your future success. This unit aims to introduce you to Deakin University's online learning system DSO in the context of teaching you some fundamentals of scientific thinking, experimental design, data and scientific communication.

These units are designed to address centrally information and digital literacy in the context of their respective fields of study.

Case 2: Developing digital media literacy in political leadership in the arts, and business ethics in management

Political Leadership was a second and third year unit offered in the Politics and Policy Studies Major in Deakin's Faculty of Arts (discontinued because of staff departure in 2006 but used as illustrative of issues involved; see Barton (2005) for further case information). It was taught on two of Deakin's campuses and off-campus to about 120 students in total. The unit was offered in extended online form, with face-to-face lectures and tutorials provided to on-campus enrolled students. The unit aimed to develop in students an understanding of key theoretical elements of political leadership, approaches to understanding why political leadership succeeds and why it fails, an ability to evaluate critically examples of political leadership so as to derive general principles from specific cases, a knowledge of how the personal and the general intersect in political leadership, an ability to apply insights into how the personal and general intersect in current developments, and to analyse what motivates political leaders, how they act as change-agents in society, and why they fail. Holt, Barton and Barton (2004) set out the rich range of digital material (text, audio and video) developed and adopted in applying political theory to a diverse array of political leaders. Broadcast documentary material was used along with a large number of

electronic readings and Internet resources. Assignment choice was provided with students being allowed to study political leaders not directly covered in the unit, some of whom would require extensive Internet searching, e.g. 2004 US presidential candidates. Consequently, this unit required students to immerse themselves in both digital and broadcast materials, and Internet resources to understand the contemporary world of political leadership based on political theory.

Business Ethics, a third year, elective unit in the Management Major in Deakin's Faculty of Business and Law commerce degree, also benefited in its development from the model established in Political Leadership (see Wood (2005) for more case information). Audio and video-based case material was organised by topic and media type on CDs, complemented with an online environment for communication, online assessment and other learning resources. It is taught at two of Deakin's campuses and off-campus nationally and internationally to about 80 students in total. The unit aims to give students an awareness of the role that ethical issues play in business life, an ability to articulate and discuss the principles of business ethics, a capacity to demonstrate their understanding of business ethics through the development of skills in analysis, problem solving and writing, and the skills to argue for their perceptions of each concept in a manner that highlights an attempt to reach a deeper, more balanced understanding of the issues concerned.

The unit adopts a case approach to illuminate ethical theorising and decision making approaches. So, for example, in dealing with the topic on Rules, roles and responsibilities, a case study, Joe Camel is used, along with a supporting digitised television documentary, Tobacco Wars, an audio interview with a representative from the Australian Institute of Management, and links to relevant Internet sites. Bates' (1995, p.75) observation that, "'Open-ended' documentary style programmes can be a valuable teaching resource, if used to encourage students to interpret, analyse and problem-solve" is equally applicable to such material used in *Business Ethics* and *Political Leadership*. In order to support students gaining maximum value from all of the digital media in *Business Ethics*, the Unit Team Chair has devised 'audio and video guides to study' to help structure students' engagement as they work through these resources. The desirability of this type of learning process support material is reinforced in regard to early research undertaken at the UK Open University on students' use of broadcast media (see Bates and Gallagher, 1987). This research found that students can often miss the major educational messages incorporated in audio-visual resources in the absence of appropriate guidance on the best ways of engaging with and learning from these media. The research related to documentaries on broadcast television which, in some cases, were reproduced on video and audio cassette. The cassette has now been replaced by reproductions on CD, DVD and online allowing for a tighter integration of text, still image and audio-visual learning resources.

Political Leadership and *Business Ethics* therefore represent significant digital developments requiring forms of multimedia digital literacy in bringing together political and ethical theorising on the one hand, with case study documentaries and expert perspectives on the other. Both units demand students to engage more widely and critically with popular broadcast media and Internet resources in understanding the contemporary and compelling nature of their subject matter.

Case 3: Dealing with sensitive knowledge and digital materials in sociology in the arts

Sex, Crime and Justice in Electronic Society, a third year elective unit in Deakin's Bachelor of Arts program, is a wholly online unit which was offered for the first time in semester 2, 2005 (see Zajdow (2005) for further case information). It is taken by students enrolled in sociology, criminology and women's studies majors in the Arts' degree as their required wholly online unit. The Unit Team Chair describes the learning outcomes of the unit as follows:

> One, we wanted students to step back and consider the social world, even the electronic world in a less technologically determinist fashion and that was the hardest thing to get across. …Two, the notion that a whole heap of crimes and criminal activity that exists on the net now is somehow new when clearly it is not new. …I really wanted them to consider was just because it's on the net doesn't actually make it real, truthful or in any way useful

> and that was very hard to get across …You know, just because it's there, doesn't mean that it's useful so they have to start thinking about it somewhat more reflectively and critically.

Importantly in this unit, while there is discussion about social changes around sexual identity and the internet, as well as sex crimes on the net, students are not required to, nor are they able to, access internet pornography sites. University policy clearly states that users of university servers are prohibited from accessing pornographic or other such sites and the unit team thoroughly endorsed this policy. In the unit, continuous assessment tasks involve online data retrieval and analysis activities and the undertaking of a major research project and report. This unit deals with a number of sensitive issues from a multi-disciplinary perspective, challenging students to apply social science theorising in order to engage critically with popular broadcast media's treatment of such issues, and also immersing students in online communicative environments to experience the notion of 'electronic society, or community in action' as related to their learning of the subject.

Case 4: Improving analytical skills for developing media and communication literacy

Advertising: Designing Desires, is a third year elective unit in the Media and Communication Major in Deakin's Faculty of Arts. The unit was offered for the first time in semester 2, 2005 (see Hughes (2005) for further case information). Its rationale as a wholly online unit was outlined by the Unit Team Chair: 'If you're going to do a unit which investigates and explores an aspect of, shall we say, popular culture or the contemporary public sphere…it seemed to me only right and proper that we should use an electronic environment because much of advertising – like much of contemporary popular culture – exists in an electronic environment such as online would provide'. Students use a set of analytical tools and themes to engage with provided learning resources, all of which are in digital form made available both on CD and online. Much of the learning resources are advertisements either originally created in digital form or converted to digital for the purposes of the unit. The unit highlights the importance of forms of digital visual literacy grounded in disciplinary tools and themes. Students are formally assessed on their ability to integrate theories and practices of advertising; and to apply those theories and practices in other sectors of communication.

Reflecting on the first offering of the unit, the Chair makes a number of observations on the nature of the unit's assessment requirement, outcomes and areas for enhancement: 'I wanted it to be enjoyable in the sense of stimulating and exciting and that comes through in the assessment, where I ask students firstly to analyse adverts but also to use their analysis and to use the resources of the unit to then change one or more aspects of an advert so that it means a different thing. …What's not been explicit is, in a sense, what aspects of the unit have led them to take the decisions they took. Now that is a weakness of the assessment. I've not asked them to explain what they've done and so that's fair enough. Some can clearly do that and some in fact have volunteered the information but …I've already started redrafting it to make them be more explicit about what they're doing and why – in the same way that I've tried to be explicit in what I'm doing and why as I provide them with analyses and exemplars that are also part of the assessment'. Students, as active producers of their own digital work, will be required to develop *forms* of digital literacy ranging from IT literacy in being able to capture, create, upload and share their work to critical visual literacy in engaging with various advertising forms to disciplinary literacy in working with communication theories and themes.

Key educational design, evaluation, research and technology considerations

Each of these cases sheds new light on the meaning of information and digital literacies in our contemporary culture imbued with generative media. The cases represent local efforts to work with discipline-contextualised, digital literacy with all its attendant multimedia, communicative and collaborative know-how developed in particular settings. One unit chair expresses the struggle that this entails:

> …what would it feel like to do what I've called a lateral unit rather than a linear one; and…how much value is there in the current cant about learning being student led rather than being teacher led? So I thought, how can I create a unit which, while offering the

> things that I think, as an experienced academic, students need to know in this particular area, offers those things in such a way, that a) there is no predetermined path through them and b) enables students to acquire that knowledge, information and expertise in ways that make more sense to them. …So in other words, I wanted to say to them, 'Here's this stuff, go and do it', but I also wanted to say, 'This is how you do it' and those seemed to me to be irreconcilable (Unit Team Chair: *Advertising: Designing Desires*).

This is an age at Deakin University characterised by the move to extended and wholly online units. At its heart, it has been curriculum innovation – new ways of conceiving what, why and how students should learn – and carrying with it new views on critical discipline-specific digital *literacies*, which has provided some of the most potent ways of mobilising and using digital and online technologies in our own institution. This is a problematic curriculum design challenge as can be seen from the Unit Chair quoted above because as Candy (2004, p.39) observes too, 'Yet, while there is a burgeoning literature about the use of digital technologies in education…much of this turns out to be fundamentally about enduring educational problems and issues, rather than about anything dramatically new and transformational. …many of those experimenting with ICT in classrooms are doing precisely that – simply experimenting with ICT – and leaving fundamentally unchanged important aspects such as the structure of the curriculum, the dominant modes and purposes of assessment, and most importantly the powerful role of the teacher, trainer or facilitator and the relative powerless and dependent role of the student, trainee or learner.'

We emphasise 'literacies' because these new e-learning environments require the development of layers of different types of literacy from technical to visual to the critical and methodological, based on different disciplines' modes of enquiry. The cases highlight the importance of mastering these literacies as key educational goals of the respective subjects. For each, the aspiration is to develop in students critical faculties in better engaging with, understanding and acting constructively within their worlds. Educational design strategies in support of new educational aspirations need to focus on both student circumstance, and the location and development of critical information and digital literacy capacities at the unit and course levels. In regard to the former, institutions like Deakin must service the needs of a broad range of student cohorts on-campus, cross-campus and off-campus nationally and internationally in ways consistent with its core commitments to rural and regional engagement, and equity and access for individuals and groups who might not otherwise enjoy the benefits that flow from participation in higher education (*Taking Deakin University Forward* 2005). For example, how does one deal with the following two student profiles at opposite ends of the technology access and technical competence spectrum: Judy the 17 year old school leaver, entering University with a broadband enabled computer in her bedroom and Personal Communication Device in her purse, and who works 10-15 hours per week mainly on Friday nights and weekends and intends to be a "Full-time Uni student" (described by Luckow, 2003 as the 'Google generation'); and Bob the mature age student from a small community in outback Queensland who works full time has a poor phone connection and no computer at home, minimal computer skills, and whose nearest reliable internet connection is 200 km away in "local" library that is open from 10:00-4:00 Monday-Friday.

A fair, inclusive approach to developing information and digital literacy in the online age for these student profiles is imperative. In regard to the latter, there is a need to recognise when the unit's subject matter is about the new technologies and hence treat information and digital literacy as a pivotal curriculum design issue as in the cases of *Sex, Crime and Justice in Electronic Society* and *Advertising: Designing Desires.* It is important to locate these types of units and their special contributions to the development of information and digital literacy in the context of their majors and courses, or students' overall sense of their course learning experience. Appropriate learning resources need to be developed and teachers need to model appropriate engagement with such resources and online communication processes reflecting accepted modes of enquiry of the discipline. These modes of enquiry should make explicit the criteria by which sound judgements can be made, and exemplify the appropriate use of online search tools and search strategies (Candy, 2004). Formal assessment tasks eliciting desired forms of learning from digital and online environments need to be designed.

Comprehensive and well integrated technology systems are required to support the aspirations of some of these cases. At Deakin, while our learning management system has been integrated with the University's administrative systems, more work is being done to integrate these with a Digital Object Management

System, a synchronous communication tool, a lecture audio and video streaming system, and recording live off air media systems. Staff and students need multimedia content creation tools at their 'fingertips', the competence to use them effectively and upload, download and manipulate various types of digital material cost-effectively for teaching and learning purposes. The advent of Learning Management Systems and Digital Media Object Repositories for information 'management' and content 'delivery', has been misconstrued as providing instant, ready-made *education*. On the face of it, there is a sense that students are managed as content is managed and the challenge of facilitating active, productive learning using digital technologies is somehow ignored. McLuhan and Fiore (1967) stated that 'The environment we create becomes our medium, for defining our role in it!', and that students want 'roles' and 'total involvement'.

More recently Diana Laurillard (2005) advocated 'productive action-learning' by students and a national Australian Universities Teaching Committee (AUTC) funded project conducted over several years researched and advocated the use of Information and Communication Technologies for specified 'learning designs' that create high quality student e-learning experiences involving activities and interactions (see Agostinho, Oliver, Harper, Hedberg & Wills, 2002). *'Learning-experience design'* for productive pedagogies online is a relatively new field with as yet few exemplary practices. Active and productive learning online by students, with the corresponding presentation of the artefacts of their new knowledge and capabilities, should be an emerging focus of technology development. The goal is for students to use digital tools, processes and resources in a manner that cannot be otherwise achieved in a congruent and authentic manner in a physical learning environment. Students should use digital tools and processes to source, analyse, manipulate, synthesise, create and present works in *digital gallery*-type environments which would in turn add great value to current corporate technology systems. These environments will increasingly adopt the newer social software approaches and tools, such as Blogs, Wikis and podcasts, to enhance the learning experience through live teaching/learning, feeds, and open and collaborative knowledge creation and sharing activities. The move to the read-and-write Web, so-called Web 2.0, opens up new dimensions of digital literacy for learners and teachers as active consumers, and critical readers and editors of information (see Richardson, 2006, pp.126-27).

Finally, these curricular, digital and online developments lead us to re-examine students' conceptions of, and approaches to learning, and their demonstrated learning outcomes in these types of digital and online teaching/learning environments. It could be argued that the same re-examination is necessary in relation to reflections on teachers' conceptions and approaches to effective forms of teaching in such environments. Moreover, renewed research on the development of critical digital and information literacies in key disciplines, professional fields and technology domains would seem essential, along with understandings of how such literacies could be more systematically developed through key levels of study. The relationship of 'information literacy' to other graduate attributes in developing the student as person/professional requires ongoing attention.

Conclusion

We have argued that new understandings of information and digital literacies can be an integral part of curriculum innovation in higher education and provide a constructive entry point into examining the ways in which e-learning can add enduring teaching and learning value. This view is consistent with conceptions of quality learning and teaching in higher education and their consideration in the context of the newer digital and online-based environments. The cases illustrate how a number of important questions relating to information and digital literacies, lifelong learning, and digital and online technologies, are being addressed in the context of curriculum innovation. However, we suggest that while the established and stable communication media technologies are an essential foundation for the innovative curriculum aspirations of educators, the new social-software technologies, for example, challenge both students and teachers to interact constructively in new ways within contemporary culture. New roles for learner and teacher challenge the polarized concepts of teacher centredness and student centredness. In higher education, parties communicating in any educative endeavour need new skills in the contemporary literacies. The cases report how one higher education institution is attempting to engage proactively and creatively with e-learning possibilities, and hence demonstrate leadership in educational design and development in relation to the literacies required in this digital age.

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